Docket No.: A-2820

CERTIFICATION

I, the below named translator, hereby declare that: my name and post office address are as stated below; that I am knowledgeable in the English and German languages, and that I believe that the attached text is a true and complete translation of German published application No. DE 100 21 449.5, filed with the German Patent Office on May 3, 2000.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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A-2820

CUTTING DEVICE

Specification

The invention relates to a cutting device for peripheral trimming of products, in particular stitched or otherwise joined-together sheets of paper, having a transport device and a first drive mechanism, driving the transport device, as well as a lifting device for moving knives that perform the peripheral trim, and having a second drive mechanism that drives the lifting device.

In a gather-stitcher, the products arriving from a stitching machine are delivered via a delivery table to a transport system of a cutting device. The products taken over from this transport system are transported to front stoppers and straightened. By means of the cutting device, the trimming of the products on three sides is done. Two different cutting principles exist: cutting the products while stopped, and cutting the products in motion. While cutting the products in motion, as can be expected, is complicated and expensive and hence can be employed only in high-speed machines of over 16000 T/h, cutting while stopped is employed in the lower and medium performance range. Here a distinction is made between two different systems. In the first, a belt transport system is used, which unclamps the products immediately prior to the trimming and moves on. In the second system, a belt transport system can be used which fixes the products and comes to a stop with them shortly before the cutting operation.

The three-sided trimming is done in individual steps. The front cut is made in a first cutting station with the

transport system stopped. The product is then fed by the transport system to a second cutting station. The top and bottom trim are also made while the transport system is stopped. Finally, the product trimmed on three sides is transported to the delivery end.

For more-exact positional fixation of the products, US Patent 3,981,212 proposes a cutting device for peripheral trimming of products that is capable of decoupling the drive mechanism of the knives (a front cutting knife and two side cutting knives) from the drive mechanism for the clamps, which keep the sheets stationary during the trimming. The transport system is rigidly connected to the drive mechanism of the knife motion.

In US Patent 4,505,173, a cutting device for this purpose for peripheral trimming of products is described in which for the sake of precise straightening of the products before the trimming, stoppers are brought up to the product on all four sides.

A common problem of all such cutting devices is that because of the rigid connection between the drive mechanism for the transport system and the drive mechanism for the knife motion, the product strikes the front stoppers at a certain speed. This can cause the product to recoil. To ameliorate this effect, the transport system is set such that trailing after the impact with the front stopper takes place. In most cases, a relative motion between the product and the transport means is unavoidable. The attendant frictional contact can cause markings and scratches on the product. Additional stoppers are required for straightening and restraining the product. They can also cause markings on the product. For transferring energy from the drive source and for converting the form of motion of the drive mechanism for the transport system, cam

stepping gears are used. It is possible to optimize the course of motion, to reduce the impact speed of the product at the front stopper, only within narrow limits. An adaptation of the transport system to the knife motion must be done for a single sheet format, or in other words in general the largest sheet size, making a requisite format-dependent optimization of the transporting motion impossible.

The object of the present invention is therefore to make a transport system available in which the impact speed of the product at the front stopper can be set as a function of the product, and the least possible trailing of the transport system is necessary.

This object is attained according to the invention by the cutting device having the characteristics of claim 1.

In a preferred version, the cutting device has at least one controllable motor for the transport system and one controllable motor for the knife motion. Typically, these drive sources are servomotors. Both motors are connected to corresponding control units for exchanging data and/or control signals. A central controller for these individual components is advantageous as well.

The use of a cutting device according to the invention has substantial advantages. It is possible to minimize the recoil of the product, since with the aid of an electronic controller the courses of motion of the transport system can be set to the knife motion as a function of format. Thus even at high speeds, the product is transported gently to the front stoppers, so that a higher cutting precision can be achieved. Possible deformations of the front edge of the product with the attendant markings and scratches upon impact with the

front stoppers at high speed are averted. Setting a minimal trailing of the transport system is also conveniently achieved. Because of the reduction in the relative motion between the transport system and the product, the risk of marking is reduced.

It is also possible to optimize the courses of motion of the transport system and the knife motion. For instance, by the realization of nonharmonious courses of motion, it is possible to move the knives quickly away from the product after the cut has been made, thus enabling rapid transport of the product onward. The product can be carried away immediately after the cut has been made, while the knife is still in its upward motion.

Further advantages and advantageous embodiments of the invention are presented in conjunction with the following drawing figures and their descriptions.

Individually:

Fig. 1 is a view of the cutting device for peripheral trimming of products;

Fig. 2 is a view of the drive mechanisms of the transport system and of the knife motion;

Fig. 3 is a more-detailed view of the transport system;

Fig. 4 shows a further example for the drive mechanism of the transport system;

Fig. 5 is a block circuit diagram of one embodiment of the stepping drive mechanism according to the invention.

A representative example of a cutting device for peripheral trimming with separate drive devices is shown in Fig. 1. A first drive motor 1 brings about the motion of the knife lifting device 2, to which the knives are secured. The product travel direction is indicated by arrows. A second drive motor 4, via a first and second drive shaft 5, 6, drives the belts 7, 8 of the transport system 9. For both drive motors 1, 4, control units 10, 11 are provided, which can communicate with one another by means of a connection 12 for exchanging data and/or control signals. The connection 12 can also lead to a machine control unit.

The essential elements of the drive mechanisms that achieve the two courses of motion can be seen in Fig. 2. The first drive motor 1, by means of the synchronous belt 15 of the synchronous belt pulley 21 and by means of the gear 22 achieves the vertical, nonharmonious oscillatory motion of the knife lifting device 2. The knives 3 are pressed against the knife 13 during the cutting operation. The second drive motor 4, by means of a mechanical gear 14, drives the shafts 5, 6, so that the belts 7, 8 of the transport system are moved. The arrows indicate the product travel direction.

In Fig. 3, the transport system is shown by itself. By means of a mechanical gear 14, the drive motor 4 drives the drive shafts 5 and 6 the belts 7, 8 of the transport system 9. The control unit 11 and the connection 12 for exchanging data and/or control signals 12 can also be seen. The products are braked at the front stoppers 15, as they arrive from a further transport system, not shown, from the delivery end of a stitching machine. By means of the electronic controller and the control unit 11, it is possible even at high speeds to bring the product gently against the front stoppers 15.

Another example for the drive mechanism of the transport system is shown in Fig. 4. In this embodiment, the drive shafts 5 and 6 the belts 7, 8 of the transport system 9 are driven by two drive motors 4A, 4B with associated control units 11A, 11B. The coupling of the two drive motors 4A, 4B is effected via the connection 12 for exchanging data and/or control signals, which furthermore can also lead to the control unit of the knife lifting device or to the machine control unit. The product 16 transported by way of this system is braked at the front stoppers 15. In this embodiment, in addition to the described controlled motion of the conveyor belts for the sake of gentle braking of the product, a relative motion of the conveyor belts to one another can also be achieved. In general, however, it is advantageous to coordinate the motion of the two drive mechanisms and thus of the two conveyor belts.

Fig. 5 shows the block circuit diagram of one embodiment of the stepping drive mechanism of the invention. The drive motor 1 for the knife motion is connected to the control unit 10 in such a way that a regulation of the angular position of the motor shaft, or so-called position regulation, can be accomplished. For the position regulation, a position transducer 19 is used. The drive motor 4 for the transport system 9 is also connected to the control unit 11 in such a way that a position regulation can be accomplished. A position transducer 20 is used for this position regulation. The control units 10 and 11 are coupled with one another and with the machine control unit 17 via the connection 12 for exchanging data and/or control signals. The machine control unit 17 typically has a human-machine interface 18, by way of which settings can be made. In particular, settings are contemplated that provide the machine with information about

the format and thickness of the products, the material properties of the products, and the desired speed.

For the various formats and materials to be handled, information for achieving the individual courses of motion of the transport system and of the knives is stored in memory in the electronic controller. A machine operator, by means of the human-machine interface 18, can input the relevant product parameters or select certain combinations. The machine controller then takes on the task of performing the associated courses of motion that are intended for these parameters.

List of Reference Numerals

1	Drive motor for knives
2	Knife lifting device
3	Knife
4	Drive motor for transport system
5	Drive shaft
6	Drive shaft
7	Upper conveyor belt
8	Lower conveyor belt
9	Transport system
10	Control unit
11	Control unit
12	Connection for exchanging data and/or control signals
13	Knife
14	Mechanical gear
15	Front stopper
16	Product
4A	Drive motor for upper conveyor belts
4B	Drive motor for lower conveyor belts
11A	Control unit for drive motor 4A
11B	Control unit for drive motor 4B
17	Machine control unit
18	Human-machine interface
19	Position transducer
20	Position transducer
21	Synchronous belt pulley
22	Gear

Claims

1. A cutting device for peripheral trimming of products, in particular stitched or otherwise joined-together sheets of paper, having a transport device and a first drive mechanism, driving the transport device, as well as a lifting device for moving knives that perform the peripheral trim, and having a second drive mechanism that drives the lifting device,

characterized in that

the first drive mechanism (1) and second drive mechanism (4) are embodied as separate, mutually independent drive mechanisms, and the two drive mechanisms are connected to one another via a control unit (10, 11).

2. The cutting device of claim 1,

characterized in that

the first drive mechanism (1) is linked to a first control unit (10) and the second drive mechanism (4) is linked to a second control unit (11) and the first is linked to the second control unit by a connection (12).

3. The cutting device of claim 1,

characterized in that

the first and second control units (10, 11) each enable a separate setting of a speed profile or of an electronic cam disk of the first drive mechanism (1) and the second drive mechanism (4).

4. The cutting device of one of claims 1-3,

characterized in that

the first drive mechanism (1) is connected by a first control unit (10) and the second drive mechanism (4) by a second control unit (11) to a machine control unit (17).

5. The cutting device of claim 4,

characterized in that

the machine control unit (17) has a human-machine interface (18).

6. The cutting device of at least one of claims 1-5, characterized in that

a position regulation of the applicable motor can be done with at least one control unit (10, 11), and that a respective position transducer (19, 20) is provided.

7. The cutting device of at least one of claims 1-6,

characterized in that

at least one control unit (10, 11) for the applicable motor (1, 4) has a memory-programmed controller.

8. A method for peripheral inscription of products, in particular stitched or otherwise joined-together sheets of paper,

characterized by

the following steps:

- transporting the products to a first cutting station by means of a transport device that has a first, separate drive mechanism and a control unit;

- making a first cut with a knife which is secured to a lifting station, whose motion is effected with a second, separate drive mechanism that is connected to a control unit;

- transporting the products to a second cutting station by means of a transport device that has a first, separate drive mechanism and a control unit;

- making a second cut with a knife which is secured to a lifting station, whose motion is effected with a second, separate drive mechanism that is connected to a control unit.

9. A gather-stitcher,

characterized in that

it has a cutting device of claims 1-7.

CUTTING DEVICE

Abstract

A cutting device for peripheral trimming of products, in particular stitched or otherwise joined-together sheets of paper, having a transport device and a lifting device for moving the knives that make the peripheral trim, has a separate drive mechanism each for driving the transport device and the lifting device. By means of the separate drive mechanisms, which can be set by way of control units that are connected to one another, the impact speed of the product at front stoppers can be set as a function of the product, and the least possible trailing of the transport system is achieved. Thus even at high speeds, the products are transported gently to the stoppers, and a greater cutting precision is obtained.